

US009636870B2

# (12) United States Patent

Kuzusako et al.

# (54) MODELING APPARATUS AND MODELING METHOD

(75) Inventors: Junichi Kuzusako, Saitama (JP);
Masanobu Yamamoto, Kanagawa (JP);
Akira Ookubo, Tokushima (JP);
Toshihiro Kamewa, Tokushima (JP);
Tomohide Koizumi, Tokushima (JP);
Kazuma Tamura, Tokushima (JP);

(73) Assignee: Sony Corporation, Tokyo (JP)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35

U.S.C. 154(b) by 248 days.

Takeshi Matsui, Tokyo (JP)

(21) Appl. No.: 12/736,718

(22) PCT Filed: May 14, 2009

(86) PCT No.: **PCT/JP2009/059008** 

§ 371 (c)(1),

(2), (4) Date: Nov. 3, 2010

(87) PCT Pub. No.: **WO2009/145069** 

PCT Pub. Date: Dec. 3, 2009

(65) Prior Publication Data

US 2011/0059247 A1 Mar. 10, 2011

(30) Foreign Application Priority Data

May 26, 2008 (JP) ...... 2008-136811

(51) **Int. Cl. B29C 31/00** (2006.01) **B29C 67/00** (2017.01)

(Continued)

(52) **U.S. Cl.**CPC ...... *B29C 67/0081* (2013.01); *B22C 7/02* (2013.01); *B22C 9/00* (2013.01)

## (10) Patent No.: US 9,636,870 B2

(45) **Date of Patent:** May 2, 2017

#### (58) Field of Classification Search

CPC .............. B29C 67/0081; B29C 67/0085; B29C 67/0077; B29C 35/0805; B41J 3/4073

(Continued)

#### (56) References Cited

#### U.S. PATENT DOCUMENTS

### FOREIGN PATENT DOCUMENTS

JP 2001-524897 T 12/2001 JP 2002-307562 10/2002 (Continued)

#### OTHER PUBLICATIONS

International Search Report; International Application No. PCT/JP2009/059008; Dated: Jun. 9, 2009. (Form PCT/ISA/210). (Continued)

Primary Examiner — Timothy Kennedy (74) Attorney, Agent, or Firm — Michael Best & Friedrich LLP

### (57) ABSTRACT

A powder transfer mechanism laminates powder layers containing water-soluble powder as a main component one by one at a modeling portion. An inkjet line head injects a water-based ink that dissolves the powder in an area of an uppermost layer of the powder layers laminated by the powder transfer mechanism, the area corresponding to a cross-sectional shape of a modeled object. Then, a heater heats the powder for each layer of the powder layers. Further, the heater heats the powder after the water-based ink is injected by the inkjet line head or before the water-based ink is injected by the inkjet line head. The present invention can be applied to a modeling apparatus, for example.

### 22 Claims, 6 Drawing Sheets

